

Docket No. 00884.387US1

Client Ref. No. P10649

Clean Version of Pending Claims**VIA-IN-PAD WITH OFF-CENTER GEOMETRY**

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Serial No.: 09/751,614

18. A substrate comprising:

a plurality of lands, each land having a geometric center, wherein each land has a via therein that is offset with respect to the geometric center of the land; and

a plurality of solder balls, each solder ball adhering to a respective one of the lands, each solder ball adhering to the entire respective land.

19. The substrate recited in claim 18, wherein each land has an edge, wherein each via has a geometric center, and wherein the geometric center of each via is in a region between the geometric center and the edge of its associated land.

20. The substrate recited in claim 19, wherein the geometric centers of vias of adjacent lands are offset in substantially the same direction.

21. An electronic assembly comprising:

an integrated circuit package having a plurality of contacts;

a substrate having a plurality of lands, each land having a geometric center and an edge, each land having a via therein, each via having a geometric center in a region between the geometric center and the edge of its associated land; and

a plurality of solder balls, each coupling one of the plurality of contacts to a respective one of the plurality of lands, each of the solder balls contacting substantially the entire respective land to the edge of such land.

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22. The electronic assembly recited in claim 21, wherein each via inhibits a thermally expansive substance residing in the vias from causing adjacent contacts of the integrated circuit package to be bridged when the lands and contacts are subjected to heat.
23. The electronic assembly recited in claim 22, wherein the thermally expansive substance comprises a volatile organic compound.
24. The electronic assembly recited in claim 22, wherein the thermally expansive substance comprises a volatile liquid that forms a portion of a material from the group consisting of a solder mask, a solder flux, a solder paste, a solvent, and a via cap.
25. The electronic assembly recited in claim 21, wherein the lands comprise a first group having vias offset in a first direction, and a second group having vias offset in a second direction.
27. The electronic assembly recited in claim 21, wherein the geometric centers of vias of adjacent lands are offset from the geometric centers of such lands in the same direction.
28. An electronic system comprising an electronic assembly having:
 - an integrated circuit package having a plurality of pads,
 - a substrate having a plurality of lands, each land having a geometric center and an edge, each land having a via therein, each via having a geometric center in a region between the geometric center and the edge of its associated land; and
 - a plurality of solder balls, each coupling one of the plurality of pads to a respective one of the plurality of lands, each of the solder balls contacting substantially the entire respective land to the edge of such land.

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29. The electronic system recited in claim 28, wherein each land has a geometric center and an edge, wherein each via has a geometric center, and wherein the geometric center of each via is in a region between the geometric center and the edge of a land.
30. The electronic system recited in claim 29, wherein the geometric centers of vias of adjacent lands are offset from the geometric centers of such lands in the same direction.
31. The substrate recited in claim 18, wherein each land has an edge defining a perimeter, and wherein each solder ball covers the entire respective land, including the perimeter of such land.
32. The substrate recited in claim 18, wherein each land has an edge defining a perimeter, and wherein each solder ball adheres to the entire respective land to the perimeter of such land.
33. The substrate recited in claim 18, wherein each land has an edge and a surface defined by the edge, and wherein each solder ball adheres to substantially the entire surface of the respective land.
34. A substrate comprising:
 - a plurality of lands, each land having a geometric center, wherein each land has a via therein that is offset with respect to the geometric center of the land; and
 - a plurality of solder balls, each solder ball adhering to a respective one of the lands, each solder ball adhering to the entire respective land without any material intervening between the solder ball and the respective land.
35. The substrate recited in claim 34, wherein each via has a geometric center, and wherein the geometric center of each via is in a region between the geometric center and the edge of its associated land.

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36. The substrate recited in claim 34, wherein the geometric centers of vias of adjacent lands are offset in substantially the same direction.

37. An electronic assembly comprising:

an integrated circuit package having a plurality of contacts and a centerline separating the plurality of contacts into two substantially equal portions; and

a substrate having a plurality of lands respectively aligned with the plurality of contacts, each land having a geometric center and an edge, each land having a via offset therein, each via having a geometric center located in a region between the geometric center and the edge of its associated land, wherein the lands comprise a first group having vias offset in a first direction and a second group having vias offset in a second direction, wherein the geometric centers of vias of the first group of lands are offset in a first direction and the geometric centers of vias of the second group of lands are offset in a second direction, and wherein the first and second groups are on opposite sides of the centerline.

38. The electronic assembly recited in claim 37, wherein the contacts and the lands comprise a coating of solder and wherein, during a solder reflow operation, surface tension forces in molten solder residing between the respectively aligned contacts and lands are substantially equalized between the first and second groups of lands.

39. The electronic assembly recited in claim 38, wherein each via inhibits a thermally expansive substance residing therein from causing adjacent contacts of the integrated circuit package to be bridged during the solder reflow operation.

40. The electronic assembly recited in claim 39, wherein the thermally expansive substance comprises a volatile organic compound.

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41. The electronic assembly recited in claim 39, wherein the thermally expansive substance comprises a volatile liquid that forms a portion of a material from the group consisting of a solder mask, a solder flux, a solder paste, a solvent, and a via cap.
42. The electronic assembly recited in claim 37, wherein the lands and vias are circular.
43. A substrate comprising a plurality of lands and a centerline separating the plurality of lands into two substantially equal portions, each land having a geometric center and an edge, wherein each land has a via offset therein, wherein each via has a geometric center located in a region between the geometric center and the edge of its associated land, wherein the lands comprise a first group having vias offset in a first direction and a second group having vias offset in a second direction, wherein the geometric centers of vias of the first group of lands are offset in a first direction and the geometric centers of vias of the second group of lands are offset in a second direction, and wherein the first and second groups are on opposite sides of the centerline.
44. The substrate recited in claim 43, wherein the lands are circular.
45. The substrate recited in claim 43, wherein the vias are circular.